

Appln No. 10/045,194

Amdt date September 8, 2004

Reply to Office action of June 25, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A video decoding system for receiving a digital bitstream and for decoding the digital bitstream, the system comprising:

a counter for counting a particular picture type of a plurality of pictures;

a video decoder for decoding the digital bitstream to generate ~~the~~ a plurality of pictures, each picture being associated with a flag for providing an indication on~~indicating~~ whether or not the picture is to be reduced in size to picture data prior to being stored, the indication of the flag being adaptively determined by the counter and after a picture type of the associated picture has been first determined by the decoder;

means for converting one or more pictures to picture data;

memory comprising a plurality of buffers, the picture being stored in a buffer as the picture data when the indication of the associated flag is indicating armed, and the picture being stored in two or more buffers without size reduction when the indication of the associated flag is indicating unarmed; and

recovery means for recovering the pictures from the picture data and for providing the pictures to the video decoder for use during decoding of the digital bitstream.

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2. (Currently Amended) The video decoding system according to claim 1, wherein both the indication of the associated flag is indicating armed and the associated counter is initialized when the picture is an I-picture type.

3. (Currently Amended) The video decoding system according to claim 1, wherein both the indication of the associated flag is indicating unarmed and the associated counter is initialized when the picture is a B-picture type.

4. (Currently Amended) The video decoding system according to claim 1, wherein the indication of the associated flag is indicating armed at times and unarmed at other times when the picture is a P-picture type.

5. (Currently Amended) The video decoding system according to claim 4, wherein the pictures comprise frames, the indication of the flag associated with every first P-frame following an I-frame or a B-frame is indicating armed, and the respective indications of the flags associated with other P-frames are indicating unarmed.

6. (Currently Amended) The video decoding system according to claim 4, wherein the pictures comprise fields, and the respective indications of the flags associated with up to four P-fields following an I-field or a B-field are indicating armed when the first one of ~~these~~ P-fields is a top field.

7. (Currently Amended) The video decoding system according to claim 4, wherein the pictures comprise fields, the respective indications of the flags associated with up to three P-fields

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following an I-field are indicating armed when the first one of ~~thesaid~~ P-fields is a bottom field.

8. (Original) The video decoding system according to claim 1, wherein the pictures comprise frames, the memory can store up to two frames, and the buffers comprise four half-frame buffers in a circular form.

9. (Original) The video decoding system according to claim 1, wherein the pictures comprise fields, the memory can store up to four fields, and the buffers comprise eight half-field buffers in a circular form.

10. (Currently Amended) The video decoding system according to claim 4, wherein the digital bitstream comprises a progressive-refresh bitstream, and the picture of the P-pictures type includes one or more refreshed I-slices, and wherein the indication of the associated flag is indicating armed for the picture of the P-pictures type with the refreshed I-slices at top of the picture.

11. (Original) The video decoding system according to claim 1, wherein the pictures comprise HDTV pictures and the picture data comprises SDTV pictures, and the means for converting comprises a down-converter for downscaling the HDTV pictures to the SDTV pictures, and wherein the recovery means comprises an up-converter for upscaling the SDTV pictures to the HDTV pictures.

12. (Original) The video decoding system according to claim 1, wherein the picture data comprises half-vertical resolution (HVR) pictures.

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13. (Original) The video decoding system according to claim 1, wherein the picture data comprises half-horizontal resolution (HHR) pictures.

14. (Original) The video decoding system according to claim 13, wherein the means for converting generates the HHR pictures by averaging each pair of pixels in each horizontal line of the pictures.

15. (Original) The video decoding system according to claim 13, wherein the means for converting generates the HHR pictures by selecting every other pixel in each horizontal line of the pictures.

16. (Original) The video decoding system according to claim 1,

wherein the means for converting comprises a block-based image compressor to compress the pictures in spatial domain using a gain adaptive compression algorithm to generate the picture data, the picture data comprising compressed bits, and

wherein the recovery means comprises a block-based image decompressor to decompress the compressed bits using a gain adaptive decompression algorithm to recover the pictures.

17. (Original) The video decoding system according to claim 16, wherein the compression and decompression algorithms comprise differential pulse code modulation (DPCM) algorithms.

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18. (Original) The video decoding system according to claim 17, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

19. (Currently Amended) A video decoding system for receiving a digital bitstream and for decoding the digital bitstream, the system comprising:

a video decoder for decoding the digital bitstream to generate a plurality of pictures, each picture being associated with a flag for indicating whether or not the picture is to be reduced in size to picture data prior to being stored;

means for converting one or more pictures to picture data;

memory comprising a plurality of buffers, the picture being stored in a buffer as the picture data when the associated flag is armed, and the picture being stored in two or more buffers without size reduction when the associated flag is unarmed; and

recovery means for recovering the pictures from the picture data and for providing the pictures to the video decoder for use during decoding of the digital bitstream,

wherein the means for converting comprises a block-based image compressor to compress the pictures in spatial domain using a gain adaptive compression algorithm to generate the picture data, the picture data comprising compressed bits,

wherein the recovery means comprises a block-based image decompressor to decompress the compressed bits using a gain adaptive decompression algorithm to recover the pictures,

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wherein the compression and decompression algorithms
comprise differential pulse code modulation (DPCM) algorithms,

wherein the coding efficiency of the compression
algorithm is accomplished by using a dynamic range of prediction
residues for each block to adaptively select one or more
quantization tables during compression process, and
~~The video decoding system according to claim 18,~~

wherein the quantization tables are generated based on a
statistical model of a predictor using Lloyd algorithm.

20. (Original) The video decoding system according to claim 19, wherein the block-based image compressor comprises a predictor selector for generating the predictor, and wherein the predictor for each pixel of the pictures is determined using Graham rule.

21. (Currently Amended) A method of decoding a digital bitstream, the method comprising the steps of:

decoding the digital bitstream to generate a plurality of pictures, each picture being associated with a first flag, a second flag, and a counter for indicating whether or not the picture is to be reduced in size to picture data prior to being stored in memory, the memory comprising a plurality of buffers;

determining a picture type of the picture;
counting a particular picture type of the plurality of
pictures generated using the counter;

converting one or more pictures to picture data;
storing the picture in a buffer as the picture data when the associated second flag is armed adaptively based on the
associated counter and when the first flag is enabled;

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storing the picture in two or more buffers without size reduction when the associated second flag is unarmed adaptively based on the associated counter or when the associated first flag is not enabled; and

recovering the pictures from the picture data to be used during decoding of the digital bitstream.

22. (Currently Amended) The method according to claim 21, further comprising the steps of arming the associated second flag and initializing the associated counter when the picture is an I-picture.

23. (Currently Amended) The method according to claim 21, further comprising the steps of unarming the associated second flag and initializing the associated counter when the picture is a B-picture.

24. (Currently Amended) The method according to claim 21, further comprising the step of selectively arming the associated second flag when the picture is a P-picture.

25. (Currently Amended) The method according to claim 24, wherein the pictures comprise frames, and wherein the step of selectively arming the associated second flag comprises the steps of arming the second flag associated with every first P-frame following an I-frame or a B-frame, and unarming the second flags associated with other P-frames.

26. (Currently Amended) The method according to claim 24, wherein the pictures comprise fields, and wherein the step of

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selectively arming the associated second flag comprises the step of arming the second flags associated with up to four P-fields following an I-field or a B-field when the first one of thesaid P-fields is a top field.

27. (Currently Amended) The method according to claim 24, wherein the pictures comprise fields, and wherein the step of selectively arming the associated second flag comprises the step of arming the second flags associated with up to three P-fields following an I-field when the first one of said P-fields is a bottom field.

28. (Original) The method according to claim 21, wherein the pictures comprise frames, the memory can store up to two frames, and the buffers comprise four half-frame buffers in circular form.

29. (Original) The method according to claim 21, wherein the pictures comprise fields, the memory can store up to four fields, and the buffers comprise eight half-field buffers in circular form.

30. (Currently Amended) The method according to claim 24, wherein the digital bitstream comprises a progressive-refresh bitstream, and the P-pictures includes one or more refreshed I-slices, and wherein the associated flag is armed for the P-pictures with the refreshed I-slices at top of the picture.

31. (Original) The method according to claim 21,
wherein the pictures comprise HDTV pictures and the picture data comprises SDTV pictures,

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wherein the step of converting comprises the step of downscaling the HDTV pictures to the SDTV pictures, and

wherein the step of recovering comprises the step of upscaling the SDTV pictures to the HDTV pictures.

32. (Original) The method according to claim 21, wherein the picture data comprises half-vertical resolution (HVR) pictures.

33. (Original) The method according to claim 21, wherein the picture data comprises half-horizontal resolution (HHR) pictures.

34. (Original) The method according to claim 33, wherein the step of converting comprises the step of averaging each pair of pixels in each horizontal line of the pictures to generate the HHR pictures.

35. (Original) The method according to claim 33, wherein the step of converting comprises the step of selecting every other pixel in each horizontal line of the pictures to generate the HHR pictures.

36. (Original) The method according to claim 21,
wherein the step of converting comprises the step of block-based image compressing the pictures in spatial domain using a gain adaptive compression algorithm to generate the picture data, the picture data comprising compressed bits; and

wherein the step of recovering comprises the step of block-based image decompressing the compressed bits using a gain adaptive decompression algorithm to recover the pictures.

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37. (Original) The method according to claim 36, wherein the compression and decompression algorithms comprise differential pulse code modulation (DPCM) algorithms.

38. (Original) The method according to claim 37, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

39. (Currently Amended) A method of decoding a digital bitstream, the method comprising the steps of:

decoding the digital bitstream to generate a plurality of pictures, each picture being associated with a flag for indicating whether or not the picture is to be reduced in size to picture data prior to being stored in memory, the memory comprising a plurality of buffers;

converting one or more pictures to picture data;

storing the picture in a buffer as the picture data when the associated flag is armed;

storing the picture in two or more buffers without size reduction when the associated flag is unarmed; and

recovering the pictures from the picture data to be used during decoding of the digital bitstream,

wherein the step of converting comprises the step of block-based image compressing the pictures in spatial domain using a gain adaptive compression algorithm to generate the picture data, the picture data comprising compressed bits;

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wherein the step of recovering comprises the step of block-based image decompressing the compressed bits using a gain adaptive decompression algorithm to recover the pictures;

wherein the compression and decompression algorithms comprise differential pulse code modulation (DPCM) algorithms;

wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process; and~~The method according to claim 38,~~

further comprising the step of generating the quantization tables based on a statistical model of a predictor using Lloyd algorithm.

40. (Original) The method according to claim 39, wherein the step of block-based image compressing comprises the step of selecting the predictor for each pixel of the pictures using Graham rule.

41. (Currently Amended) A video decoding system for receiving a digital bitstream and for generating a display video stream by decoding the digital bitstream, the system comprising:

a video decoder for decoding the encrypted digital bitstream to generate HDTV pictures, the HDTV pictures including one or more anchor pictures;

a block-based image compressor to compress the anchor pictures in spatial domain using a gain adaptive quantization differential compression algorithm to generate compressed bits that have been both differenced and quantized;

memory for storing the compressed bits; and

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a block-based image decompressor to decompress the compressed bits using a gain adaptive quantization differential decompression algorithm to generate the anchor pictures,

wherein the decompressed anchor pictures are used during the decoding of the digital bitstream.

42. (Currently Amended) The video decoding system according to claim 41, wherein the compression and decompression algorithms are based on DPCM and quantization algorithms.

43. (Original) The video decoding system according to claim 42, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

44. (Currently Amended) A video decoding system for receiving a digital bitstream and for generating a display video stream by decoding the digital bitstream, the system comprising:

a video decoder for decoding the encrypted digital bitstream to generate HDTV pictures, the HDTV pictures including one or more anchor pictures;

a block-based image compressor to compress the anchor pictures in spatial domain using a gain adaptive compression algorithm to generate compressed bits;

memory for storing the compressed bits; and

a block-based image decompressor to decompress the compressed bits using a gain adaptive decompression algorithm to generate the anchor pictures,

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wherein the decompressed anchor pictures are used during the decoding of the digital bitstream,

wherein the compression and decompression algorithms are DPCM algorithms,

wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process, and~~The video decoding system according to claim 43,~~

wherein the quantization tables are designed based on a statistical model of a predictor using Lloyd algorithm.

45. (Original) The video decoding system according to claim 44, wherein the block-based image compressor comprises a predictor selector for generating the predictor, and wherein the predictor for each pixel of the anchor pictures is determined using Graham rule.

46. (Currently Amended) A method of generating a display video stream using a digital bitstream, the method comprising the steps of:

a) decoding the digital bitstream to generate HDTV pictures, the HDTV pictures including one or more anchor pictures;

b) compressing the anchor pictures in spatial domain using a gain adaptive quantization differential compression algorithm to generate compressed bits that have been both differenced and quantized;

c) storing the compressed bits in memory;

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d) decompressing the compressed bits using a gain adaptive quantization differential decompression algorithm to generate the anchor pictures; and

e) repeating steps a)-d) using the decompressed anchor pictures during the decoding of the digital bitstream.

47. (Currently Amended) The method of generating a display video stream according to claim 46, wherein the compression and decompression algorithms are based on DPCM and quantization algorithms.

48. (Original) The method of generating a display video stream according to claim 47, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

49. (Currently Amended) A method of generating a display video stream using a digital bitstream, the method comprising the steps of:

a) decoding the digital bitstream to generate HDTV pictures, the HDTV pictures including one or more anchor pictures;

b) compressing the anchor pictures in spatial domain using a gain adaptive compression algorithm to generate compressed bits;

c) storing the compressed bits in memory;

d) decompressing the compressed bits using a gain adaptive decompression algorithm to generate the anchor pictures;
and

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e) repeating steps a)-d) using the decompressed anchor pictures during the decoding of the digital bitstream,

wherein the compression and decompression algorithms are DPCM algorithms,

wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process, and
~~The method of generating a display video stream according to claim 48,~~

wherein the quantization tables are designed based on a statistical model of a predictor using Lloyd algorithm.

50. (Original) The method of generating a display video stream according to claim 49, wherein the predictor for each pixel of the anchor pictures is determined using Graham rule.

51. (Original) The method of generating a display video stream according to claim 46, wherein the compression and decompression steps are performed for those anchor frames associated with a flag indicating a reduced memory mode (RMM).

52 (New) The video decoding system according to claim 4, wherein the indication of the associated flag is indicating armed only at the times when the associated counter is not equal to 2.

53 (New) The video decoding system according to claim 4, wherein the indication of the associated flag is indicating armed only at the times when the associated counter is not greater than 4.

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54 (New) The video decoding system according to claim 53, further comprising a second counter, wherein the indication of the associated flag is further adaptively determined by the second counter and wherein the indication of the associated flag is indicating armed only at the times when the associated counter and the second counter are not greater than 4.